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Apple

Bitter

Rot

U. S. DEPARTMENT OF AGRICULTURE



# Apple Bitter Rot

## *What Is It?*

Apple bitter rot is a fungus disease that in years past destroyed many crops of apples in the more southern orchards east of the Rocky Mountains. Fortunately, improvements in spraying methods and materials in recent years have, for the most part, eliminated this problem in commercial orchards, but the disease is still present in home orchards and small plantings that are not regularly treated with effective fungicides.

As the name suggests, bitter rot is principally a disease of the fruit. Growth of the fungus causing the rot is favored by periods of rainy weather with temperatures between 70° and 80° F. It is a mid-summer disease mainly spread by rain and insects. Although the disease is more prevalent in the South, it is found occasionally in northern orchards.

## *Varieties Affected*

Apple varieties show considerable difference in susceptibility to the bitter rot fungus. Golden Delicious, Jonathan, Yellow Newton, Northwestern Greening, and Grimes Golden are generally more susceptible than Rome Beauty, Stayman Winesap, Delicious, York Imperial, and Winesap. This difference in susceptibility, however, is only relative, for the infection of the fruit of any variety depends to a large degree on the right climatic conditions and nearness to sources of infection.

The disease has also been observed on cherries, pears, quinces, and peaches.

## *Description*

The fungus causing apple bitter rot is able to penetrate the uninjured skin of the fruit, and the first telltale sign of the disease is the appearance of small, light-brown, circular spots under the skin. When the spots are about half an inch in diameter, the

skin becomes depressed and small sticky beads of spores, arranged in a series of concentric circles, break through the skin. At first the spore masses are pink, but they later turn dark brown or black. Circles of spore masses are an easily observed and distinguishing symptom of the disease. Black rot, a fungus disease sometimes confused with apple bitter rot, does not produce these rings of spores.

When the bitter rot spots are small, the rotted flesh is watery, another means of distinguishing the disease from black rot. Also characteristic of bitter rot at the early stage is the cone shape of the decayed areas, with the tips of the cones pointed toward the seed cavity. As the fungus continues to grow, the diseased areas lose their cone shape and the decay eventually involves the entire apple.

The number of spots on an apple may range from 1 to as many as 500 or 1,000. When the spots are very numerous the individual spots remain small and blisterlike, giving the apple a peculiar peppered appearance.

## *How It Overwinters*

Although most of the bitter-rot-infected apples drop to the ground, the few that remain on the trees eventually shrivel into hard masses called mummies.





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*Bitter-rot-infected apples. Spore rings show well on apple at left; some spots on apple at right are early ones without spore rings.*

*Peppery type of apple bitter rot.*



The fungus can remain alive in these mummies until the following year and then produce spores to infect the new crop of fruit.

The bitter rot fungus also may live over winter in almost any cankered or dead part of the tree. Once the fungus has become established in a twig or branch, it may persist there for several years, liberating spores each year to start anew the cycle of fruit infection. Twigs and branches that have been weakened or killed by low temperature, or by diseases such as fire blight and black rot, are particularly favored spots for invasion.

When the disease first appears each season, it is not unusual to find evidence that rain has washed spores down from infected twigs and branches, and from mummies, to infect the fruit immediately below.



*Apple infected with bitter rot spores from a mummy above.*

### *Control*

Removal of mummies, cankered areas, dead twigs, and branches which may harbor the bitter rot fungus is a necessary control procedure. At times outbreaks of bitter rot can be traced to a few infected trees of a susceptible variety remaining in the orchard from a previous planting. Such trees should be removed, for the value of the fruit they produce is likely to be less than the losses they cause by serving as a reservoir of bitter rot spores that infect the fruit of adjacent trees.

After these early sanitary measures, a series of fungicidal sprays must follow—applied at spe-

cific times during the growing season. The first spray should be applied before any infections appear on the fruit. Since bitter rot rarely appears before the middle of June, the first spray is usually applied between June 10 and 15, a second spray is applied about July 1, a third application between July 15 and 20, and a fourth application during the first week of August. In orchards where the entire crop has been ruined for several years, it may be necessary to start spraying earlier than June 10–15 and to apply the sprays every 2 weeks until the fungus is under control. The sprays must be applied from all sides of the tree so all the apples are covered.

Bordeaux mixture 8–8–100, for many years the standard spray material used for bitter rot control, has been largely supplanted by the organic fungicides ferbam and captan. Sprays containing 2 pounds of either of these materials in 100 gallons of water are used. These sprays will cause less injury to the leaves than the bordeaux mixture. Dichlone, another organic compound, used at the rate of  $\frac{3}{4}$  or 1 pound in 100 gallons of water, is very effective but occasionally causes a spotting of the leaves during periods of high temperatures.

All spraying leaves a residue on the fruit which may interfere with its sale. No fruit should be sprayed beyond the period recommended on the fungicide container label, unless facilities are available to wash or brush the fruit to remove the spray residue before the fruit is offered for sale or used at home.

### CAUTION

Fungicides are poisonous; handle them with care. Read the container label carefully. Follow all directions and heed all precautions for storing, mixing, applying, and disposing of fungicides.

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By John C. Dunegan, principal pathologist, retired, Crops Research Division, Agricultural Research Service. This publication supersedes Farmers' Bulletin No. 938, Apple Bitter Rot and Its Control.

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